
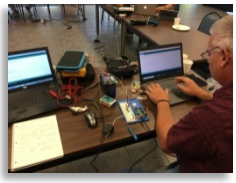
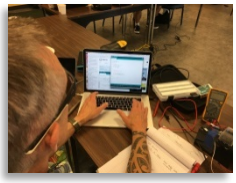

AUTOMOTIVE SOFTWARE & ELECTRONICS INTERMEDIATE BOOT CAMP

Future Tech

NATIONAL EXCELLENCE IN TRAINING

ASE Training Managers Council ATMC

AWARD WINNER 2019

As FutureTech continues to monitor how the automotive service and diagnostic market is speeding into more advanced electronic systems and S/W controls, these changes will challenge Automotive Instructors and Technicians in creating new solutions and techniques in service and diagnosing advanced automotive systems. Additionally, it is equally important that those professionals working with advanced automotive systems understand HOW to work with them. This course contains lecture with significant hands-on project content in electronics, S/W, and F/W that will make for the perfect learning environment! As with the Part 1 course, this course will use integrated circuits, electronic components, and the popular Arduino MC. Course participants will have exposure to more advanced MC, electronics, data acquisition, and communications systems for the purposes of building new H/W, F/W, & S/W knowledge and tools that can be used directly with automotive systems. Here is the course outline that lists what topics will be covered in the Part 2 Automotive Software & Electronics Systems Boot Camp Course:

- This class is a fun and highly interactive environment!
- Projects in the course will be built with MC, interface electronic and circuit board systems, and electronic components
- This course will teach participants how they can inexpensively and quickly create their own testing and diagnostic tools.
- Provide participants enough fundamental knowledge and skills that would permit them to develop their own microcontroller based applications and hardware interface tools that can be used for analyzing and diagnosing most automotive systems
- Learn how external MC systems can be built to be used with a scan tool or on-board vehicle system to manipulate or change systems operation for the purposes of circuit analysis and diagnostics or building vehicle “bugs” for automotive courses

Price: $2,195.00

Pre-Requisites:
Fundamentals Boot Camp

Instruction:
80% hands-on and 20% lecture

Hours: 8:30AM-4:30PM

Dates:
July 26-30, 2021 (Portland OR)

Instructor: Dr. Mark Quarto

Students will be responsible to bring their own laptop computer to the course (with at least one operating USB port) for the purposes of operating the MC and permit software applications to be installed for developing S/W code. The students should be prepared to bring their own oscilloscope and/or DVOM to work with the electronic devices and circuits. As part of the course package each student will receive a MC and USB cable (and keep after course completion). **This course is designed for individuals that have completed the Part 1 Automotive Software & Electronics Course.**

The specific course elements covered are as follows:

- All FutureTech Automotive Software and Electronics courses have a hands-on focus. As with the Part 1 course, this course will use the Arduino MC and dedicated circuits using new hardware devises and software code. Participants will continue to expand their experiences and skills in using Electronic Devices, MC, Software Writing, and Software Coding to build any application that they want to create. With software based controls, anything is possible!
- *Automotive Instructors* will continue to build their skills and experiences with electronic devices and coding software to control the electronic circuits that are built in the class. By enhancing their skills and experiences, Instructors participants will be able to build a broader range of simulators and vehicle demonstrators that will be meaningful to their students. Just think about what you can do with all these new skills!
- *Automotive technicians* will absolutely love continuing to learn and develop even more skills to for testing and diagnosing automotive electrical/electronic systems by using MC based diagnostic systems that they will build. As with the Part 1 course, technicians that attend the Part 2 course will expand their skills in electronics and software for use with or without the Scan Tool to help make complex diagnostics easier! Sometimes Scan Tools and Voltmeters just aren't enough to track down electronic or electrical nightmares – especially in vehicle network control systems.
- This course will build on the Part 1 course to the skills enhance skills and experiences of the participants so, at the completion of the course, they will be able to build their own control, testing, and diagnostic systems for vehicle electrification and ADAS systems. If you can think it, you can build it!

This 5-Day course contains the following topics:

Monday

- Review of Vehicle Control and Electronic Systems Architectures
- Discuss H/W and S/W Interactions in Control Systems
- Analog and Digital Circuit Operation and failure modes
- Review and build Analog and Digital Signal Conditioning circuits: The purpose of Signal Conditioning is to ensure that external signals can safely connect the MC to the outside world of motors, relay drivers, sensors, other controllers, networks, and more: This course will cover Why and What is needed, and How to build Analog Digital Signal Conditioning circuits that will interface with the MC. As part of learning and interfacing Signal Conditioning with the MC, it is necessary that participants understand the operation and application of electronic devices. The focus will be how to use these devices for building Signal Conditioning and Control Systems, and how to use these devices with a MC.
- Review and build Electronic Device Circuits: Resistor, Resistor Network, Rectifier Diodes, and Zener Diodes, and Opto-Isolators, Operational Amplifiers, Level Shifters, Logic Gates, Magnetic Field Sensing, and more!

Tuesday

MC Control Software Syntax and Functions Review: FOR, WHILE, IF, ELSE IF, and IF Loop statement usage for the purpose of connecting the MC to the outside world to control motors, relays, sensors, other controllers, networks, and more:

- Circuits that will be built to work with S/W Loops for the purposes of Signal Conditioning, Pulse Counting, and Level Sensing, Counter-Divider Circuits, Operational Amplifiers, and Voltage Level Shifters, Schmitt Trigger Circuits
- Power Electronics Switching and Amplification Devices: BiPolar Transistor Circuits, MOSFET Transistor Circuits
- Electronic Components: Logic Sensing, Magnetic Field Sensing, and Signal Conditioning: Buffers, Logic Gates, and Hall Effect Sensor
- MC Control Software Syntax and Functions: Using Millis function instead of Delay function

  more robust S/W code
- Frequency to Voltage Converter: Converting Frequency signals to a voltage output so other circuits can be controlled or triggered
- Transistor Array IC: Using an IC with an 8 Transistor Array to control 8 different outputs at one time with MC controls

Wednesday

- Automotive Temperature Sensing Circuit: Temperature sensing is the most important data that can be acquired by a MC. This circuit will be constructed, and S/W code completed by course Participants to build an operational circuit Temperature sensing circuit that could be used to monitor the temperature for any automotive circuit.
- The I^2C Data Bus and using it for Network Control of Devices: Participants will be introduced to the new world of the I^2C Data Bus and how to use data bus communications to control devices based on hex addressing. Learning the I^2C data bus will help prepare the participant for learning the automotive CAN bus.
- I^2C Display Systems: Participants will be introduced to the world of I^2C displays so data can be displayed on a remote display rather than using the Serial Data Monitor on a computer. Participants will learn how to code software to program the use of an LCD display with 4 Rows and 20 Characters (per row) to display the data of their projects during this course. Whether displaying Voltage, Temperature, Distance, Speed, or other data displays are an essential in monitoring circuits.
- High Voltage Battery Management System Circuit: This circuit will be constructed, and S/W code completed by course Participants to build an operational High Voltage Battery Management Sensing and Balancing System for a Lithium Ion battery pack cell system.

Thursday

- Automotive Proximity (IR) Sensing System: Proximity Sensing Circuits are one of the most important sensing systems that can be used by a MC to anticipate when a circuit should be actuated/triggered or when an ADAS system needs to measure. This circuit will be constructed, and S/W code completed by course participants to build and calibrate an operational circuit.
- Automotive Collision Sensing (IR) System: Proximity Sensing Circuits for sensing an imminent collision event are one of the most important sensing systems used by an ADAS MC to anticipate when a circuit should be actuated or triggered. An electrical and electronic circuit will be constructed, and S/W code completed and calibrated by course participants.
- Automotive LIDAR Distance Sensing System: LIDAR systems are one of the most critical systems within an ADAS sensing system but, can be used in any system that needs to measure distance or movement. Understanding and being able to construct and calibrate a LIDAR based system projects in this course will provide participants experiences that will help them to transition into the high technical world of ADAS.

Friday

- Automotive ADAS Collision Avoidance System: ADAS systems are quickly becoming a mainstream system on almost every vehicle product. A basic ADAS Collision Avoidance Sensing circuit using an Ultrasonic Sensor will be constructed and S/W code completed by course Participants to build an operational sensing circuit.
- Frequency Counting and Function Generator Applications Using MC: Counting frequency for triggering an electronic circuit is a primary function within automotive circuits. Whether triggering injectors, ignition coils, or any circuit that needs triggering through counting frequency – knowing how to use frequency counting is vital. The same is true for transmitting (sending out) sine or square waves to trigger an external circuit. Software systems that can count frequency or develop waveforms to send out to other circuits is a critical function of a control circuit. Participants will construct the S/W code and verify that the controller can read and write signal circuits (sine or square wave) and interface the software with external electronic circuits.
- Group Final Project – the class will work in groups of 2 or 3 to completely write the software and select the proper hardware components to complete a Group Final Project. The project will be disclosed to the groups on the final day of the course. Those groups successfully completing the final project will be given a second course certificate that signifies their successful completion of the final project.